Pure Gas: Deuterium

DESCRPTION

Deuterium is a heavier and stable isotope of ordinary hydrogen. It is a colorless, odorless, nontoxic, diatomic, flammable gas. Similar to molecular hydrogen, the diatomic Deuterium molecule has both ortho- and para-isomerism. At room temperature, Deuterium exists as a 2:1 equilibrium mixture of ortho-para isomers. This is referred to as equilibrium Deuterium. Deuterium is used in nuclear power, fusion power, deuterated optical fibers, deuterated lubricants, lasers, light bulbs, R & D laboratories and annealing semiconductor materials. Methanol-D4 is a common base material used in the fabrication of Deuterium compounds. It is prepared by deuterating ordinary methanol. All four of the ordinary hydrogen atoms are replaced by Deuterium atoms in the process. Spectra Gases Material Safety Data Sheets (MSDS) are available for Deuterium gas and should be used as guidelines in regard to first aid, methods of storage, handling and general use of Deuterium.

PURITY SPECIFICATIONS (MAXIMUM IMPURITY LEVELS)*			
Contaminant Chemical Purity Isotopic Enrichment	Semiconductor 99.999+ 99.8%	Research Grade 99.999% 99.8%	UHP Grade 99.995% 99.7%
Carbon Dioxide (CO_2)	0.5 ppm	1 ppm	2 ppm
Carbon Monoxide (CO)	0.5 ppm	1 ppm	1 ppm
Deuterium Hydride (HD)	3000.0 ppm	3000 ppm	5000 ppm
Hydrogen (H2)	100.0 ppm	100 ppm	150 ppm
Nitrogen (N_2)	1.0 ppm	1 ppm	5 ppm
Oxygen (O_2)	0.5 ppm	1 ppm	1 ppm
Total Hydrocarbons (THC)	0.5 ppm	1 ppm	1 ppm
Tritium ^3H	< 0.002 uCi/L	< 0.002 uCi/L	< 0.002 uCi/L
Water (H_20)/Deuterated water D2O	1. 0 ppm	1.0 ppm	5 ppm

** Higher purities are available upon request.*

CYLINDER INFORMATION					
Purity	Cylinder Size*	Valve Outlet*	Volume Cu.Ft./Liters	Gross Weight Lbs/Kg	Pressure Psig/Bar
	2	350/724	261.0 / 7400	117 / 53	2265 / 157
	2	350/724	219.0 / 6200	117 / 53	2000 / 139
Semiconductor	3	350/724	073.0 / 2100	50/ 23	1980 / 137
Research	4	350/724	038.0 / 1100	25 / 11	2000 / 139
UHP	5	350/724	1.7 / 50	11 / 5	1950 / 135
	LB	170	1.7 / 50	3.5/1.6	1800 / 125

** Additional cylinder sized and/or valve outlets are available upon request.*

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PHYSICAL CONSTANTS		
Chemical name		D_2 or $^2H_2$
Molecular weight		4.032
One mole of D_2		0.0040332 kg
Specific volume of the gas at 70°F (21,1° C), 1 atm		95.9 ft3/lb, 5.987 m3/kg
Boiling point at 1 atm	Normal Deuterium 66.7% o-D_2 Equilibrium Deuterium 97.80% o-D_2	–417.1°F, –249.5°C –417.1°F, –249.5°C
Triple Point at 1 atm	Normal Deuterium 66.7% o-D_2 Temperature Pressure	 –426.0°F, –254.4°C 171.3 mbar; 128.5 mmHg
Absolute Density, Gas @ 14.7 psia (1 bar)	@ +32°F (0°C)	0.180 kg/m3
Density, Liquid, Equilibrium	Deuterium @ -423°F (-252.8 °C)	0.169kg/l
Critical temperature at 1 atm	Normal Deuterium 66.7% o-D_2 Equilibrium Deuterium 97.80% o-D_2	–390.7°F, –234.8°C –390.7°F, –234.8°C
Critical pressure	Normal Deuterium 66.7% o-D_2 Equilibrium Deuterium 97.80% o-D_2	241.5 psia, 16.65 bar 239.2 psia, 16.50 bar
Critical Compressibility Factor		0.312
Flammability in Air		5% - 75% (by volume)
Latent heat of fusion at triple point Equilibrium Deuterium @ -426.1°F (-254.5 °C)		47.07 cal/mol, 194.94 J/mol
Molar specific heat (+25oC)	@ 14.7 psia (1bar) and +77oF @ Constant Pressure @ Constant Volume	6.98 cal/(mol °C) 29.204 cal/(mol °K) 4.990 cal/(mol °C) 20.878 cal/(mol °K)

SHIPPING DATA	
Chemical Symbol	D_2 or $^2H_2$
CAS Register Number	7782-39-0
DOT Classification	Flammable gas
DOT Label	Flammable gas
Transport Canada Classification	2.1
Substance Identification (SI)	1957
UN Number	UN 1957
Hazards	Fire and High Pressure
Toxicity (TLV)	Non Established
Flammability Range (in air)	4.0% - 75%
Odor	None